

## CLAIMS

We claim:

1. A plasticating apparatus of the type wherein a rotating screw having a helical flight, known as the primary flight, being disposed within and cooperated with a inner wall of a heatable barrel having inlet and outlet openings, and whereby particles of resinous material are introduced through said inlet opening to a helical valley extending along the axis of the screw to be plasticated by said screw and advanced towards said outlet opening, the improvement comprising said screw comprising a feed section, transition section and metering section in succession, said metering section to supply additional melting capability, mixing capability and pumping capability, a significant increase in the flight pitch taking place at the distal end of the transition section whose purpose is to achieve a similar channel volume and shallower flight depth, a un-harmonious change in the root and flight transition with the final flight depth occurring forward or rearward of the complete revolution of the flight ,from time to time a second increase of the flight pitch and un-harmonious change in the root and flight transition designed to accomplish the same, said geometry dependent upon such factors as the flighted length to screw diameter ratio, screw diameter, and resin composite.
2. A plasticating apparatus of claim 1 wherein the first increase in the flight pitch that occurs at the distal end of the transition section is about between 1.20 and 1.50 times the pitch of the transition and feed sections that is generally constant.
3. A plasticating apparatus of claim 1 wherein the first change in the flight pitch that occurs at the distal end of the transition section also forms a tangent point along the axis of the screw and root, said tangent point being the point where a change in the angle of the root occurs in a un-harmonious motion with the change in the flight, said change in the root ends preferably about between .7-.9 or 1.1-1.3 times the flight pitch farther towards or closer to the end of one complete revolution of the flight.
4. A plasticating apparatus of claim 1 wherein a second change in the flight pitch that occurs from time to time is about between 1.1-1.2 times greater than said first increase in the pitch, whereas said change in the root ends preferably about between .7-.9 or 1.1-1.3 times farther towards or closer to the end of one complete revolution of the flight.
5. A plasticating apparatus including a rotating screw within a heatable barrel having

helical valley extending along said flight directed towards said outlet opening, said screw having a metering section for purposes of melting and mixing resinous material at high temperatures, the helical valley within said metering section having a shallower than normal flight depth and greater than normal flight pitch and from time to time a second or tertiary change in the flight pitch whose purpose is to make room for a single or multiple array of relatively short interrupted helical intra-flights extending from said helical valley or a un-interrupted cross channel barrier flight extending from said valley and intersecting with the primary flight.

6. A rotating screw of claim 5 wherein in the metering section, a increase in the pitch angle should be about between 1.07-1.15 times greater than the preceding flight pitch angle, so to create a workable increase in the channel width while maintaining a similar channel depth, although it can be greater or smaller thereto depending upon other factors listed above.
7. A rotating screw of claim 5 wherein said helical intra-flight has a length about between .15-.20 times the screw diameter, said width about between .025-.040 times the flight pitch, the number of rows determined by diameter, resin type and length to diameter ratio, but three rows are typical for a screw diameter between 41mm and 70mm, the pattern for the rows generally following the same helix angle formed by the primary flight, the number of sets to be determined by diameter, resin type and length to diameter ratio, but between 2-3 sets are typical for a screw diameter between 41mm and 70mm.
8. A rotating screw of claim 5 wherein said un-interrupted cross channel barrier flight extends from said helical valley and originates from the leading edge of the primary flight while forming about between a 15 to 30 degree angle with the screw axis and continues to traverse the channel to join with the trailing edge of said primary flight, said barrier flight width being similar to said intra-flight, with a flight clearance that varies about between .030"- .090", the flight clearance being the difference in height between the top of the barrier flight and the top of the primary flight, said number of barrier flights to be determined by screw diameter, resin type and length to diameter ratio, but between 2-3 flights are typical for a screw diameter between 41mm and 70mm.
9. A screw for a plasticating apparatus, the plasticating apparatus having a heatable barrel with a inner wall and inlet and outlet ports, the screw comprising a un-interrupted helical flight which cooperates with the inner wall of said heated barrel, a helical valley extending along said flight, a metering section for melting and mixing

- a). A single increase in the flight pitch that is about between 1.35 to 1.5 times the prior pitch with a un-harmonious change in the transition of the root that starts at the same tangent plane along the axis of the screw, said change in root ends preferably about between .7-.9 or 1.1-1.3 times the flight pitch farther towards or closer to the end of one complete revolution of the flight
- b). Two flight pitch changes occurring in succession, separated by a constant depth metering section, the first change being a increase of about between 1.20-1.25 times the original flight pitch, the second increase is about between 1.35-1.5 times the original flight pitch, both pitch changes accompanied by a change in the root with a un-harmonious change in the transition of the root that starts at the same tangent plane along the axis of the screw said change in the root ends preferably about between .7-.9 or 1.1-1.3 times the flight pitch farther towards or closer to the end of one complete revolution of the flight.
- c). A increase in the flight pitch that is about between 1.35 to 1.5 times the original pitch with a un-harmonious change in the transition of the root that starts at the same tangent plane along the axis of the screw, a second change in the pitch that is about between 1.07 to 1.15 times the prior pitch so as to widen the flight to accommodate a single or multiple array of relatively short interrupted helical intra-flights and or a un-interrupted cross channel barrier flight.

The screw described herein whereas the specific geometry is determined by such factors as the flighted length to screw diameter ratio, screw diameter and resin composite, that executes at least one significant increase in the flight pitch in cooperation with a un-harmonious change in the flight root transition whose purpose is to achieve a more uniform thoroughly melted and mixed resinous material.